

BRIDGING THE GAP BETWEEN SCIENTISTS AND CLASSROOMS: SCIENTIST ENGAGEMENT IN THE EXPEDITION EARTH AND BEYOND PROGRAM. P.V. Graff¹, W.L. Stefanov¹, K.J. Willis¹, S. Runco², ¹Jacobs Technology ESCG/NASA Johnson Space Center, Houston, TX, 77058, (paige.v.graff@nasa.gov), ²NASA Johnson Space Center, Houston, TX, 77058.

Introduction: Teachers in today's classrooms need to find creative ways to connect students with science, technology, engineering, mathematics (STEM) experts. These STEM experts can serve as role models and help students think about potential future STEM careers. They can also help reinforce academic knowledge and skills. The cost of transportation restricts teachers' ability to take students on field trips exposing them to outside experts and unique learning environments. Additionally, arranging to bring in guest speakers to the classroom seems to happen infrequently, especially in schools in rural areas. The Expedition Earth and Beyond (EEAB) Program [1], facilitated by the Astromaterials Research and Exploration Science (ARES) Directorate Education Program at the NASA Johnson Space Center has created a way to enable teachers to connect their students with STEM experts virtually. These virtual connections not only help engage students with role models, but are also designed to help teachers address concepts and content standards they are required to teach. Through EEAB, scientists are able to actively engage with students across the nation in multiple ways. They can work with student teams as mentors, participate in virtual student team science presentations, or connect with students through Classroom Connection Distance Learning (DL) Events.

Expedition Earth and Beyond (EEAB): This Earth and planetary science education program is designed to inspire, engage, and educate teachers and students by getting them actively involved with NASA exploration, discovery, and the process of science. The program provides a structure for students in grades 5-12 to conduct authentic research about Earth and/or other planetary bodies and includes the opportunity for student teams to submit a request for new data to be acquired from the International Space Station. The program also provides stand alone, standards-aligned, inquiry-based activities in addition to opportunities for students to connect with scientists and STEM experts. The program uses astronaut photographs, provided by the Crew Earth Observations (CEO) payload on the International Space Station [2-3] as the hook to help students gain an interest in a research topic. Student teams are encouraged to also use additional NASA data available from other orbital platforms, including imagery and data from robotic planetary spacecraft exploring other bodies in the solar system.

Scientists as Mentors: Student teams conducting authentic research through EEAB have the opportunity to work with a mentor. Mentors are scientists or STEM experts who help provide guidance and input to student research. Mentoring takes place through the use of the Expedition Earth and Beyond Team Workspace Wiki [4]. Teams model the process of science and post the progress of their research on their team workspace wiki as they conduct their investigation. Mentors provide feedback, suggestions, and encouragement through the discussion area on the team wiki. Mentoring takes approximately 1-2 hours a week and continues throughout the student team investigation. Student research investigations can extend from four weeks to a semester or longer, depending on the team. This type of long-term connection and participation of a mentor helps students see the authenticity of their research and see the relevance of what they are learning in school. These authentic connections with mentors also allow students to be introduced to exciting potential career opportunities as they learn about missions and activities their mentor may be involved with as part of their professional career.

Participation in Virtual Student Team Science Presentations: Student teams who conduct research through EEAB have the opportunity to present their research and results to their mentor, in addition to other STEM experts. These virtual student team science presentations are facilitated through the use of WebEx, an easy-to-use online conference tool that only requires an internet-connected computer and a speaker phone. Team presentations have enabled students to share their research with other teachers, students, and school administrators in addition to professional Earth and planetary scientists. The opportunity for students to share their investigation with others, especially University and/or NASA scientists, is especially motivating. Virtual team presentations only require approximately 15-20 minutes per team. This includes participant introductions, the student team science presentation, and discussion and questions from the participating STEM experts.

Scientist Engagement in Classroom Connection Events: Classrooms not conducting a research investigation can still connect with scientists through the EEAB Classroom Connection Distance Learning (DL) Events. These DL events connect students in grades 3 through 12 with scientists and STEM experts who lead interactive and engaging presentations. A presenter

begins the session with an overview of his/her professional goals, interests, hobbies, and the story of how he/she ended up in their current position. This introduction allows the scientist to be “real” in the eyes of the students and makes what he/she has accomplished feel achievable. Presentations focus on a broad range of topics such as remote sensing, comparative planetary, and/or planetary exploration. Topics can also focus on relevant subjects students may be studying in school such as volcanic, impact, fluvial, or aeolian processes. Technical requirements are minimal – an internet-connected computer and speaker phone. Throughout the connection, scientists ask students questions to gain insight into their prior knowledge, to gauge their understanding, and to help keep students engaged. Acknowledgement of student responses helps motivate and provide positive reinforcement to participants. At the end of each session there is additional time for questions and answers. Based on feedback from participating STEM experts, classroom teachers, and students, these connections are exciting, inspiring, motivating, and extremely valuable experiences.

Conclusions: In order to continue to bridge the gap between scientists and classrooms, there needs to be the following: 1) Classrooms interested in connecting with scientists, 2) Scientists willing and interested to connect with students, and 3) Meaningful, time-friendly, flexible ways to ensure those connections can occur. The Expedition Earth and Beyond Program has been able to identify and address each of these needs by: 1) Identifying interested classrooms, 2) Identifying interested scientists, and 3) Creating multiple ways to connect scientists and classrooms. Through the program, scientists can engage with classrooms as mentors, participate in student team science presentations, or facilitate Classroom Connection DL event presentations. Each of these ways have proven to be meaningful, time-friendly, and doable from the perspective of classroom teachers and professional scientists. Scientists can participate from the comfort of their own office, and teachers can participate at no additional expense, while reaping the benefits of exposing their students to scientists and STEM experts working in unique and exciting environments. The EEAB Program will continue to improve and expand the opportunities to connect scientists with classrooms, striving to continue to bridge the gap and help inspire, engage, and educate our nation’s next generation of scientists, engineers, science educators, and STEM-literate citizens.

References: [1] *Expedition Earth and Beyond*, <http://ares.jsc.nasa.gov/ares/eeab/index.cfm>, [2] Stefanov W. L. (2008) *Phi Kappa Phi Forum*, 88 (1), 2-7,

[3] Robinson J. A. et al. (2002) *International Journal of Remote Sensing*, 23 (20), 4403-4438, [4] *Expedition Earth and Beyond Team Workspace Wiki*, <http://eeabstudents.wikispaces.com/Participating+Teams>

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